Modular, Plug and Play, Distributed Avionics, Phase II

Completed Technology Project (2007 - 2008)

Project Introduction

The objective of this SBIR effort was to prove the viability of an Ethernet version of the MicroSat Systems, Inc. (MSI) modular, plug and play (PnP) spacecraft avionics architecture. This revolutionary architecture provides a near-term solution to modular, plug and play avionics while distributing power and data management functions on a single circuit allowing rapid interfacing to other satellite avionics such as the GSFC Space Cube. By integrating the MSI protocol converter technology with the ABET Technologies Digital Current System, MSI can provide a network with standardized attachment nodes that carries data and power on an Intelligent Power/Data Ring (IPDR).The IPDR network, which can host a variety of data protocols, currently implements a high speed SPA-S (SpaceWire) core to support the AFRL PnP efforts. It enables full PnP modularity reducing spacecraft integration and test to a few days. Since the system is implemented with a common set of nodes for every interface instead of custom cards in a card cage, the hardware costs are dramatically lower as well, only 40-60% of comparable centralized systems. Using commercial Ethernet parts integrated into the existing IPDR node processor and interface boards successful proof of concept testing was performed during Phase I. The transfer of Ethernet data frames was demonstrated into the IPDR ring via a peripheral Ethernet device, from one IPDR node to another, and finally back out of the ring to the external Ethernet device. Figure 1 shows the setup of the final node-to-node Ethernet communication test. Although this testing verified the fundamental functionality of Ethernet communication on the IPDR ring avionics, there is significant effort remaining to mature this into a flight worthy avionics architecture . The Phase II will investigate flight parts selection for the nodes, firmware development required to improve bandwidth, and flight qualification and delivery of a Ethernet version of an IPDR node.

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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Goddard Space Flight Center (GSFC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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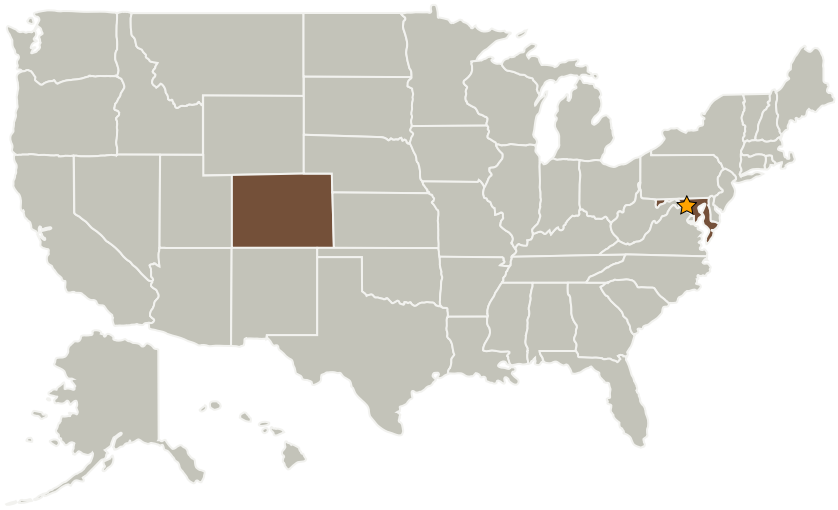
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Goddard Space Flight Center(GSFC)	Lead Organization	NASA Center	Greenbelt, Maryland
MicroSat Systems, Inc.	Supporting Organization	Industry	Littleton, Colorado

Primary U.S. Work Locations	
Colorado	Maryland

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX02 Flight Computing and Avionics
  - TX02.1 Avionics Component Technologies
    - TX02.1.6 Radiation Hardened ASIC Technologies